SECTION I
GENERAL DESCRIPTION

1. PURPOSE AN BASIC PRINCIPLES

The Model FFR Communication Receiver has been designed to fulfill the long existing need for a sturdy, easily tuneable, single frequency receiver, which will provide maximum flexibility and thoroughly dependable, unattended, continuous reception of AM radio telephone, CW telegraph or teletype, and MCW telegraph signals.

The design of this receiver is a departure from the conventional single channel receiver in that it provides for both crystal and VFO operation of the HFO and BFO. The front end is simply and accurately tuned by a single Frequency Tuning Dial with a vernier reduction ratio of 10 to 1, which permits maximum traverse speed and ease of operation. A specially designed input transformer provides an impedance matching circuit suitable for use with a straight wire antenna, a balanced doublet, and a 75 ohm unbalanced or 300 ohm balanced line.

The Model FFR is available in frequencies of 50 to 400 Kcs., 500 Kcs., and 2 to 32 Mcs. depending upon the tuning drawer used. These drawers are sturdily built and incorporate the 1st RF, 2nd RF, VFO, and Mixer circuits. This type of construction provides excellent shielding between stages and minimizes the difficulties usually encountered with this type of receiver.

When used in the TMC Model RCR Remote Control Receiver System, control of the HFO, BFO, and Sensitivity is accomplished on a tone basis; in addition, provision is made for ON/OFF control of the AVC and BFO. This feature is particularly useful when the receiver is to be used remotely for CW and phone operation. This remote control provides the following:

TUNING DRAWER	HFO SHIFT
FFRD-1,2,3	±2 Kcs.
FFRD-3M	±3 Kcs.
FFRD-5,6	±2 Kcs. per Mc.
FFRD-7	±1.5 Ksc. per Mc.
FFRD-8	32 Kcs. throughout the band.

The BFO shifts not less than ±2.5 Kcs. manually and remote control.

Output terminations are provided so that two receivers may be used in diversity for CW, FS and Phone services, and either receiver may be used in the MASTER or SLAVE position by front panel switches in the BFO and HFO circuits. The AVC bus, HFO, BFO, IF, and Diode Load are all brought out to the rear of the receiver chassis for diversity inter-connection. When used in diversity, crystal control of the HFO and BFO is also possible, providing a very compact dual diversity system requiring only 10-1/2 inches of space.

2. DESCRIPTION OF UNIT

The Communication Receiver, Model FFR, is shown in Figure 1-1. The panel is 3/16 inches thick by 10 inches long and 5-1/4 inches high, and is finished in TMC grey enamel. The chassis extends 15 inches behind the panel and is supported to the panel on each side by brackets. The controls most often used are located on the front panel, while the terminal connections are located at the rear of the receiver chassis.

Facilities for remote control applications have been provided at the rear of the receiver. For short distance operations (within a one mile radius) a +4.5 volts D.C. applied separately to terminals 1 and 7 (on terminal strip E-102) and a -9.5 volts D.C. applied to terminal 8 of terminal strip E-101 will provide remote control of the HFO, BFO and RF GAIN respectively. Also, a toggle switch must be connected to the BFO ON/OFF terminals and turned to its ON position. For remote control by frequency shifted tones, the TMC Remote Control Receiver System, Model RCR is used to provide the necessary control functions. In addition, any remote control system, which provides the necessary D.C. voltages as mentioned above, may be used in conjunction with the Model FFR.

Vacuum tubes are readily accessible from the top of the Model FFR and are mounted in a vertical position. All components are so mounted that trouble-shooting and maintenance may be easily accomplished.

3. TECHNICAL SPECIFICATIONS

Frequency Range:
H.F. 2 to 32 megacycles in four ands.
L.F. 50 to 400 and 500 kilocyc.es in four bands.

Band Change:
By means of plug-in tuning drawers, each

covering the following frequencies:

FFRD-1	covers 50-100 Kcs.
FFRD-2	covers 100-200 Kcs.
FFRD-3	covers 200-400 Kcs.
FFRD-3M	covers 500 Kcs.
FFRD-5	covers 2-4 Mcs.
FFRD-6	covers 4-8 Mcs.
FFRD-7	covers 8-16 Mcs.
FFRD-8	covers 16-32 Mcs.

Type of Reception:
AM, CW, and MCW signals. FS when used with appropriate Audio of IF type Frequency Shift Converter.

Tuning System:
Single dial control.

Antenna Input Circuit:
75 ohms unbalanced, 300 ohms balanced.

Oscillator Circuit:
Variable Manual Tuning
Fixed Frequency Crystal
External Excitation from Master Osc.

BFO Circuit:
Variable Manual Tuning
Fixed Frequency Crystal
External Excitation from Master Osc.

Sensitivity:
1.0 micro volt for a 10 db Signal to Noise Power ratio.

Image Ratio:
Better than 60 db for 2-16 Mcs., not less than 40 db for 16-32 Mcs.
Image Rejection Infinite on L.F. Heads.

AVC Characteristics:
With an 80 db change in the input signal, the output remains constant within 12 db.

Hum Level:
Across 600 ohm load, output hum not less than 34 db below 0 dbm or 66 db across 2 watts.

Output Power:
2 watts maximum.

Input Power:
110/220 volts, 50/60 cycles, approximately 85 watts.

Noise Limiter:
A Noise Limiter circuit is provided, which provides maximum effectiveness in combating impulse noise.

Rear Panel Facilities:
Antenna Connections.
Fuse.
BFO Connections.
HFO Connections.
IF Connections.

Accessary Voltage Source:
6.3 volts AC @ 1 amp
150 volts DC @ 10 milliamps

Front Panel Controls:

Main Chassis	Tuning Drawers
Noise Limiter Switch.	Tuning Dial.
Pilot Light.	HFO Master-Slave Switch.
Audio Gain Control.	Crystal Trimmer.
Phone Jack.	Tuning Dial Lock.
BFO Master-Slave Switch.	Selectivity Switch on Band 1, 2 and 3
AVC/MANUAL Switch.	
BFO ON/OFF Switch.	
RF Gain Control and Power ON/OFF Switch.	
BFO Pitch.	

Rear Panel Facilities terminals provided for:

HFO control	RFG control
HFO IN	AVC ON/OFF
HFO OUT	AVC Bus
BFO control	Diode Load
BFO IN	Loudspeaker
BFO OUT	ANTENNA
IFO OUT	

Mounting:
Standard WE rack mounting.

Size and Weight:
19'' wide x 5 1/4'' high x 15'' deep, (w/coaxial), approximately 35 lbs.

Tube Complement:
FFR
3 each 6BA6, IF Amplifier.
1 each 6AL5, Detector and AVC.
1 each 6T8, Noise-Limiter, Audio.
1 each 6AQ5, Audio.
1 each 6J6, BFO Reactance Tube.
1 each 6AG5, BFO Oscillator.

1 each 5Y3GT, Rectifier.
1 each OA2, Voltage Regulator.

FFRD-1,2,3,3M,5,6, and 7:
4 each 6AG5, RF Amplifiers, HFO.
1 each 6AU6 Mixer.

FFRD-8:
3 each 6AK5 RF Amplifiers, HFO.
1 each 6AU6 Mixer.
1 each 6AG5 HFO Reactance Tube.

Construction and Components:
Equipment is manufactured in accordance with JAN specifications wherever practicable.

* * *

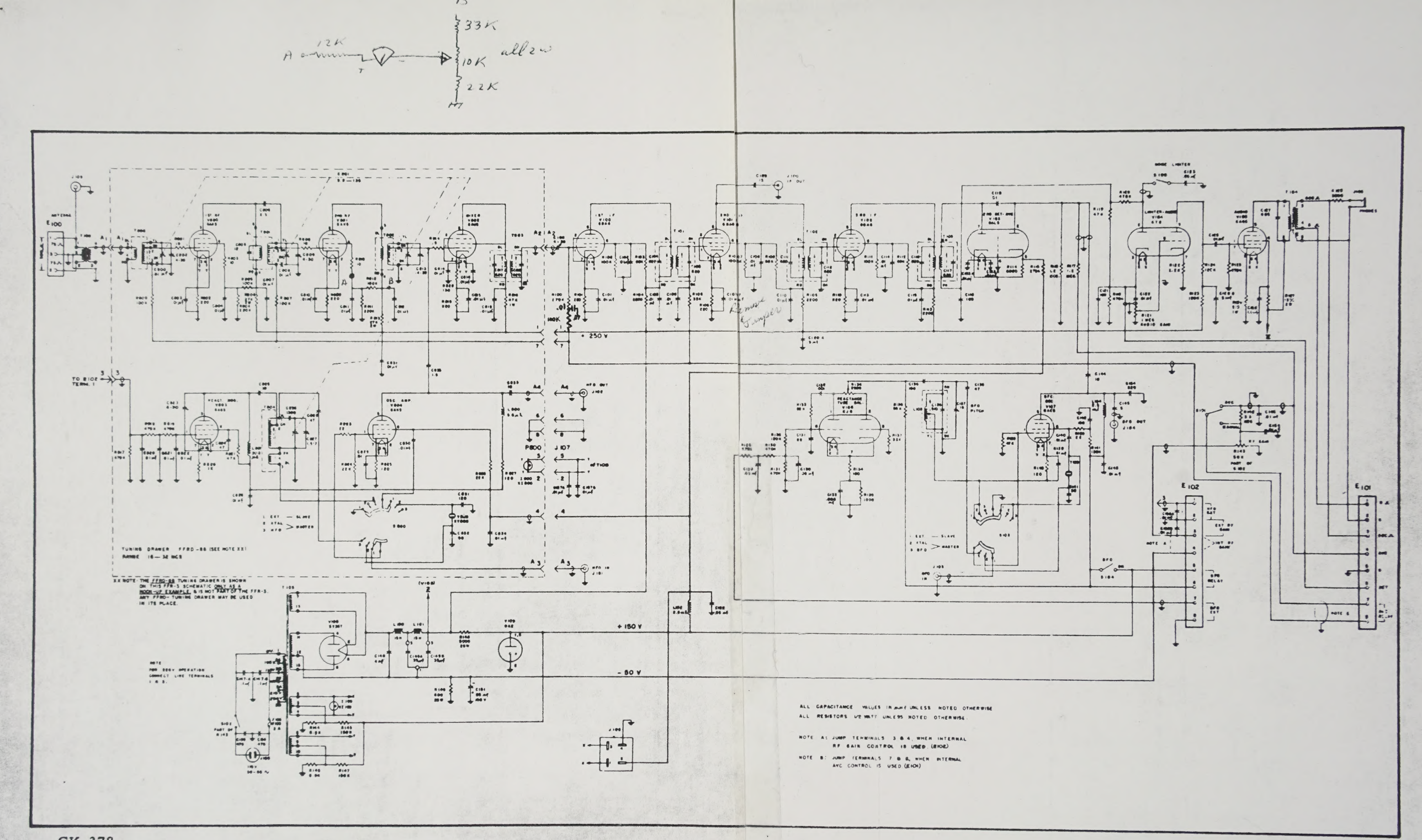
We reserve the right to make changes in the design of our equipment, consistent with good engineering practice, in order to make improvements in design and to effect economies in manufacture.

TABLE 1-1. PERFORMANCE DATA

(Approximate Values - Taken from Production Receiver)

Head	Frequency Kc	Sensitivity in Microvolts for 1 volt across diode load (Approx. 2 watts output)	Antenna Input in Microvolts for 10 db Signal - Noise Ratio	I.F. Rejection db
FFRD-1	50 75 100	1.10 1.20 1.00	1.10 1.20 1.00	134 120 110
FFRD-2	100 150 200	1.10 1.20 1.20	1.10 .85 1.30	114 106 92
FFRD-3	200 300 400	1.30 0.07 0.55	1.30 1.20 0.65	100 90 60
FFRD-3M	485 500 515	0.60 0.50 0.40	0.80 0.80 0.80	50 60 68

	Frequency Mc			Image Ratio
FFRD-5	2.0 3.0 4.0	0.40 0.50 0.60	0.62 0.64 0.68	132000 24000 9600
FFRD-6	4.0 6.0 8.0	0.40 0.60 0.65	0.52 0.56 0.58	32000 6500 1600
FFRD-7	8.0 12.0 16.0	0.50 0.10 1.00	0.65 0.85 0.90	12000 3000 1000
FFRD-8	16.0 24.0 31.0	0.75 0.60 0.40	0.60 0.67 0.72	2400 500 290



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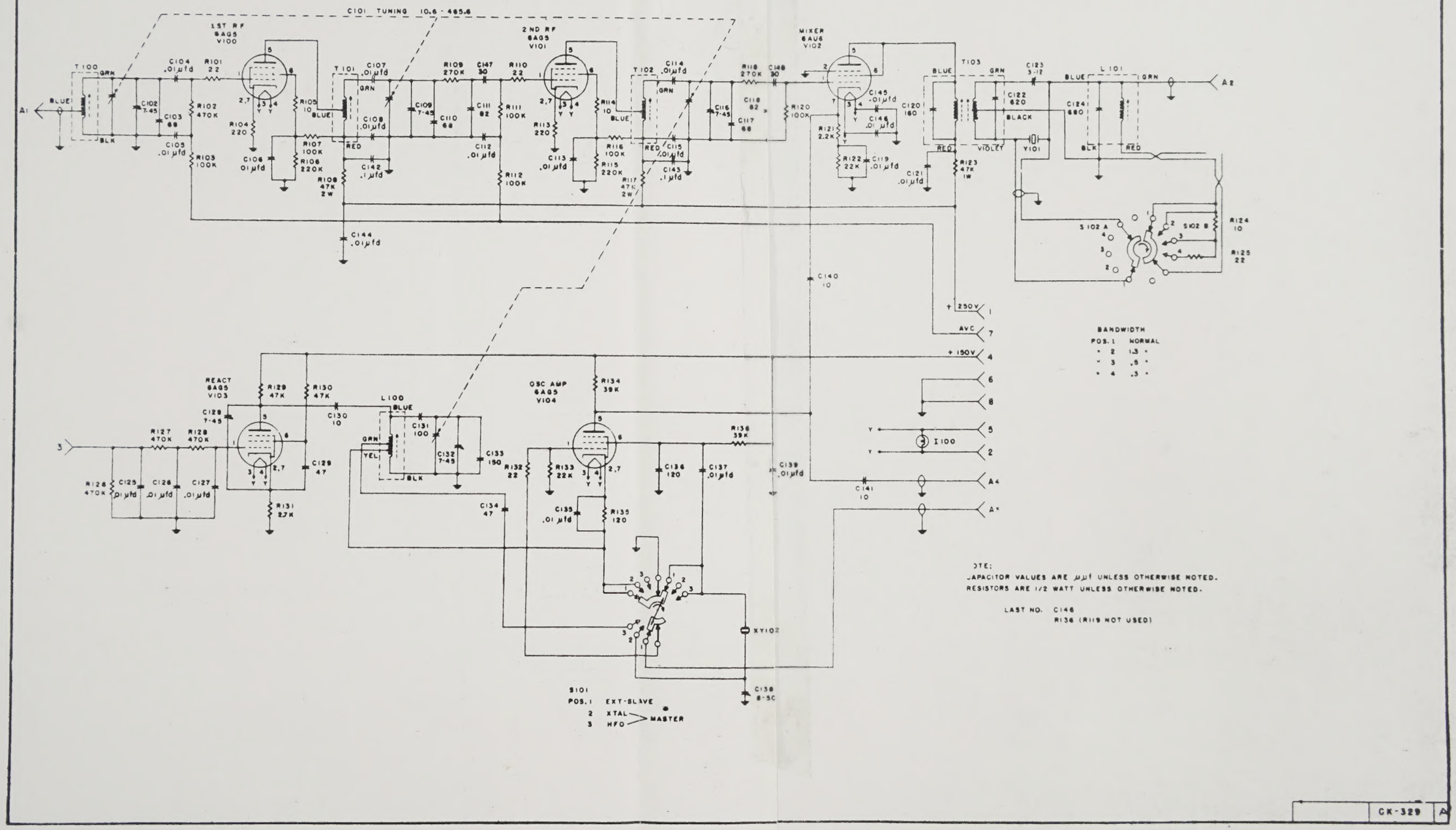
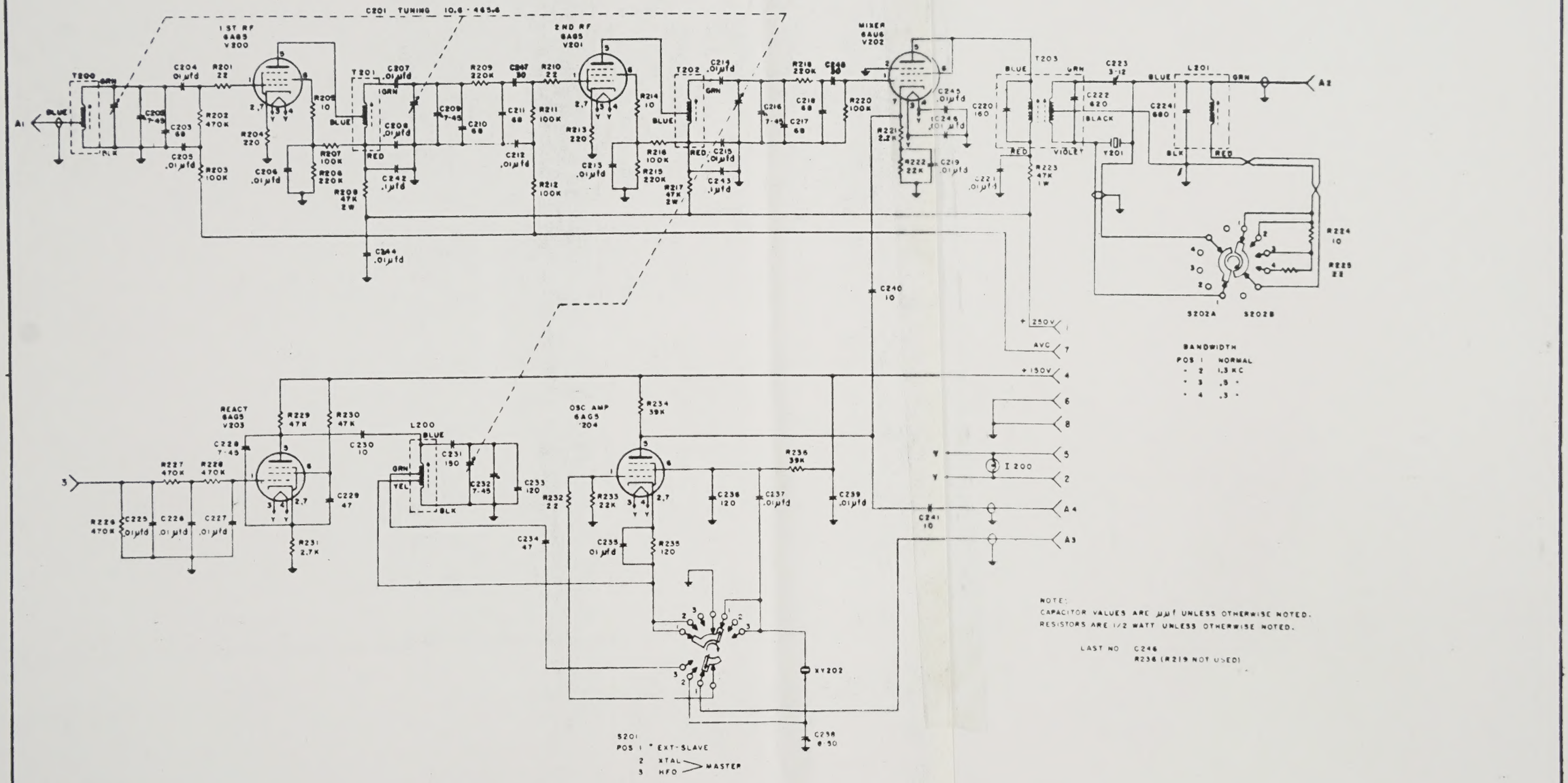
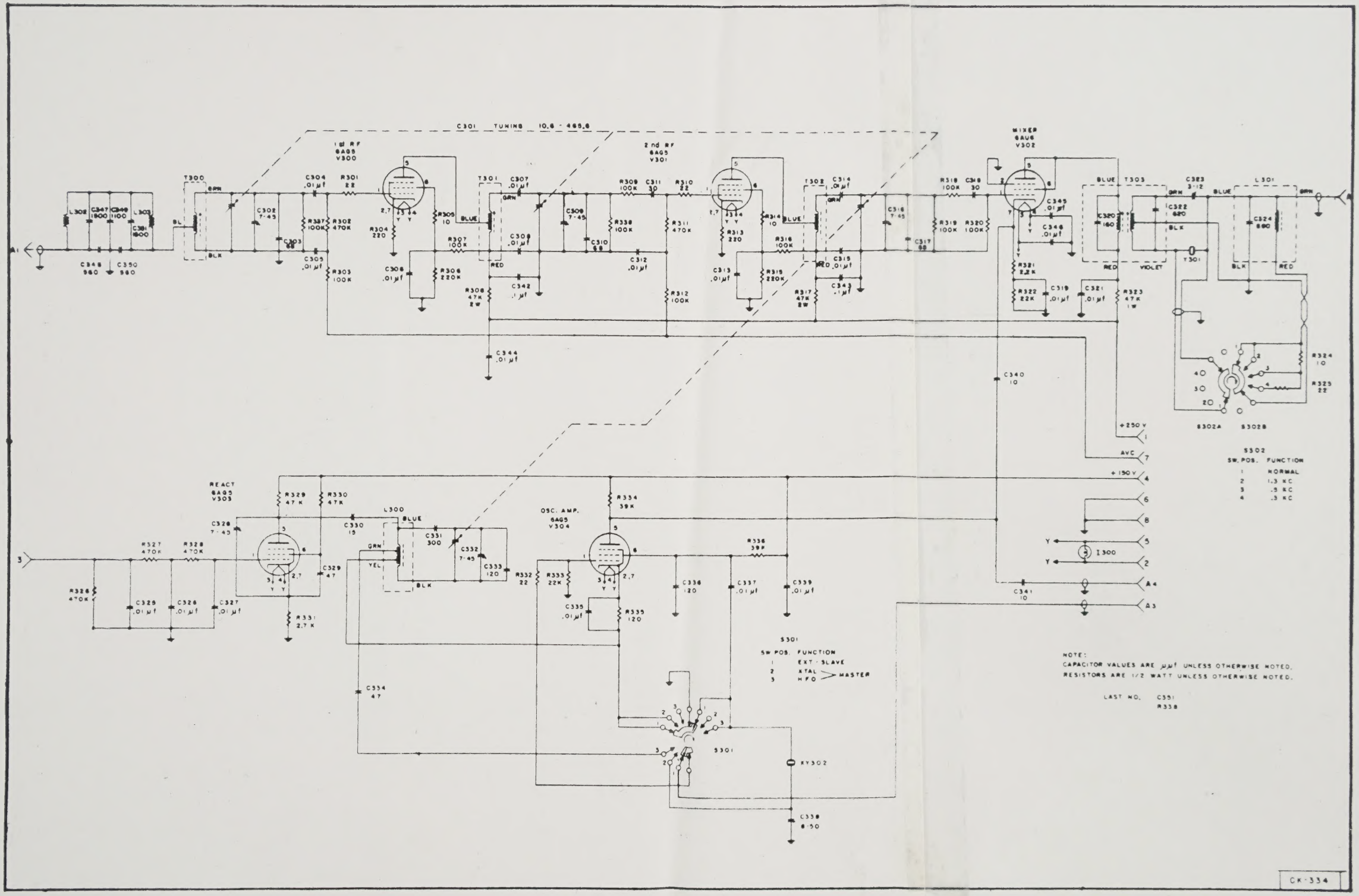
Schematic Diagram, Model FFR-3



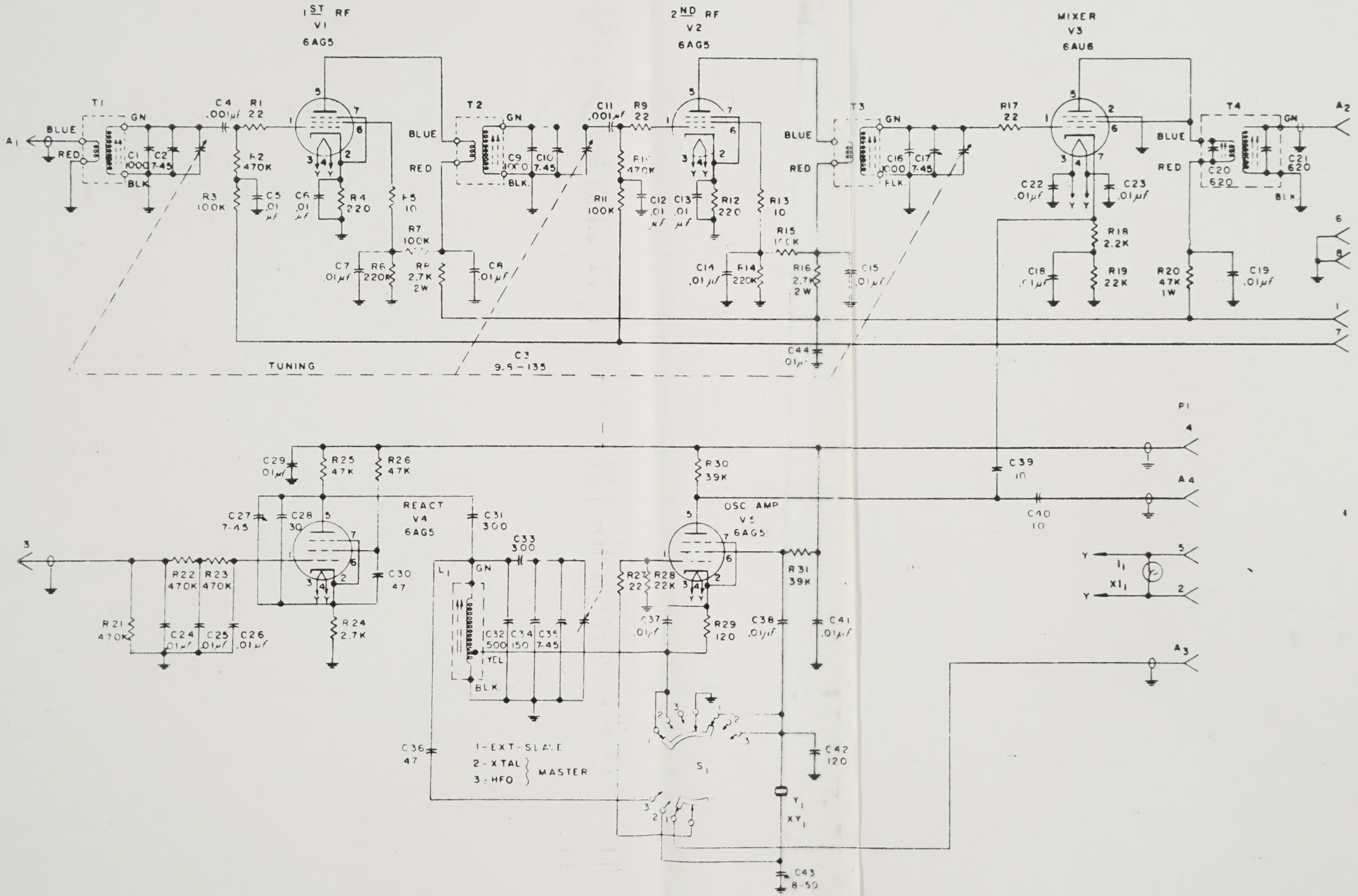
Schematic Diagram, Model FFRD-1



Schematic Diagram, Model FFRD-2



Schematic Diagram, Model FFRD-3



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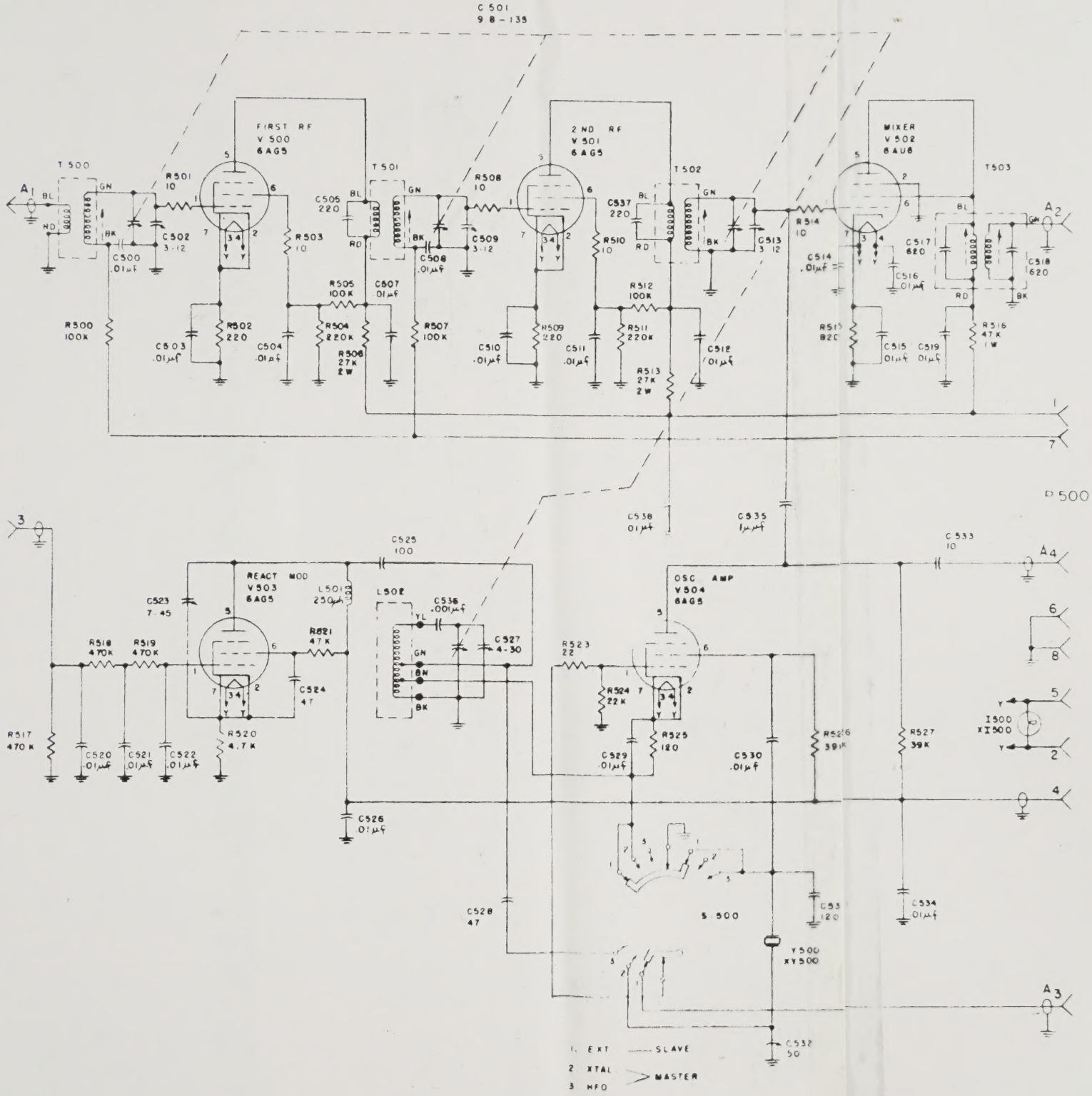
Schematic Diagram, Model FFRD-3M



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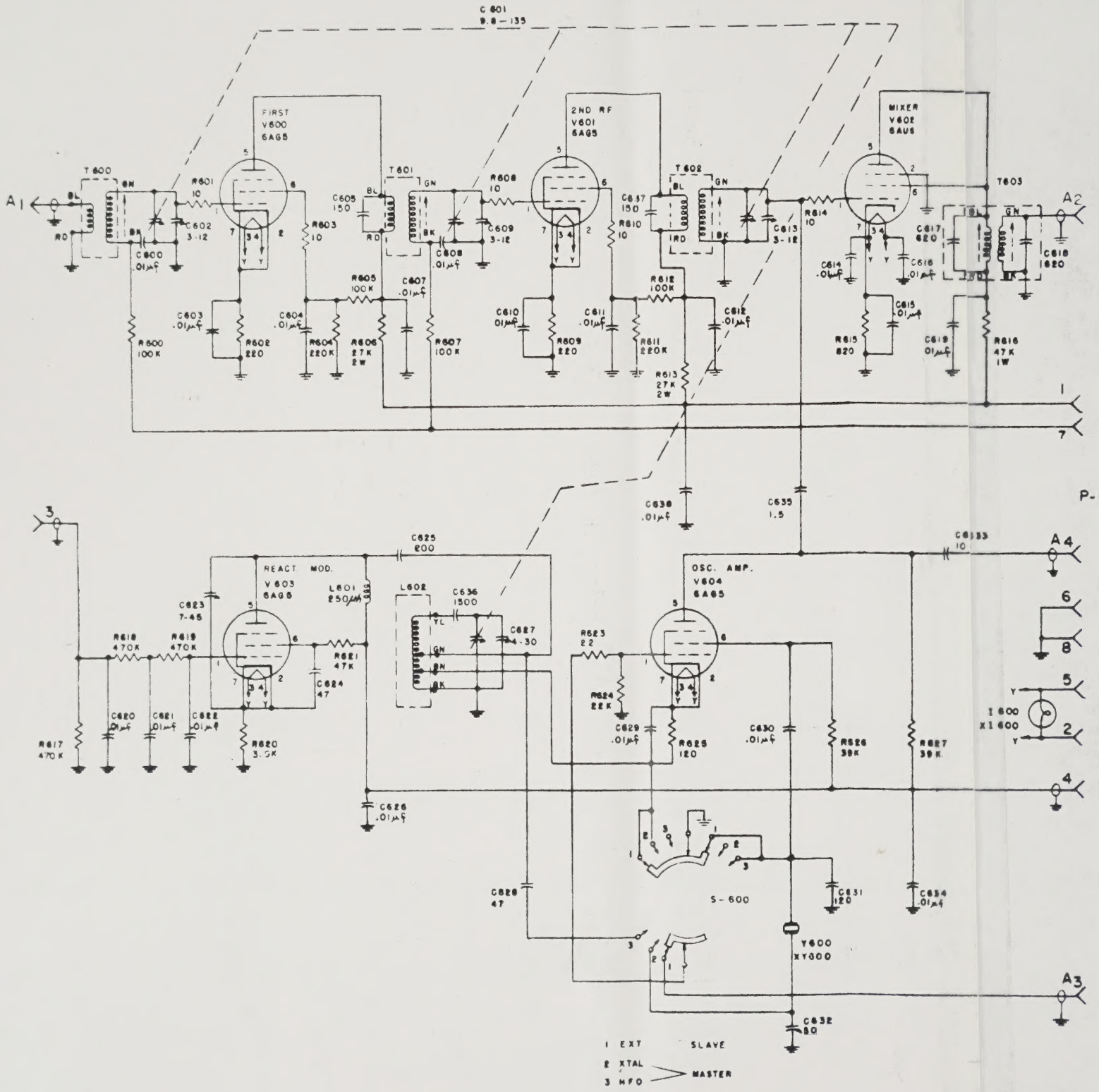
Schematic Diagram for FFRD-5



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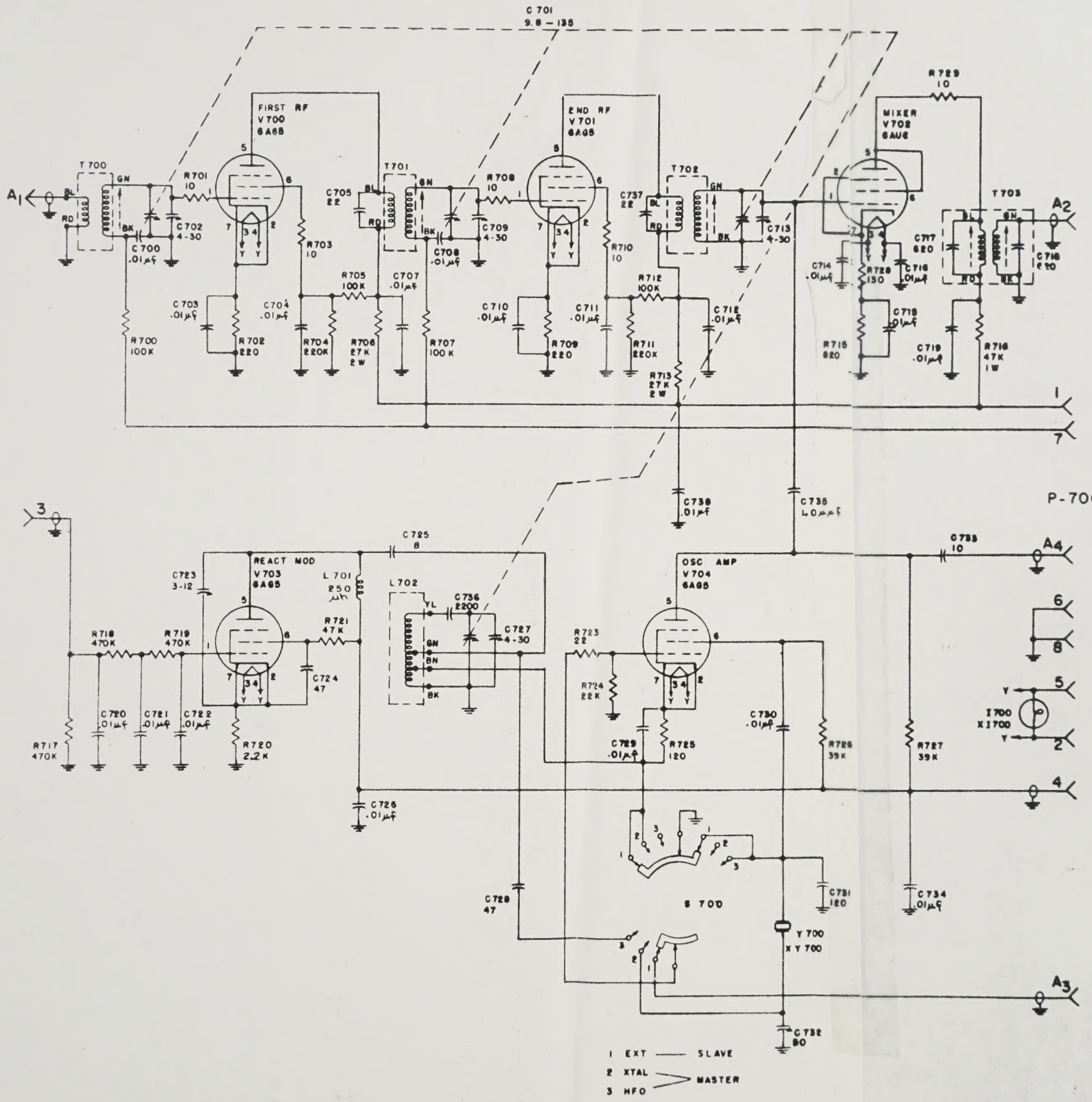
Schematic Diagram for FFRD-6



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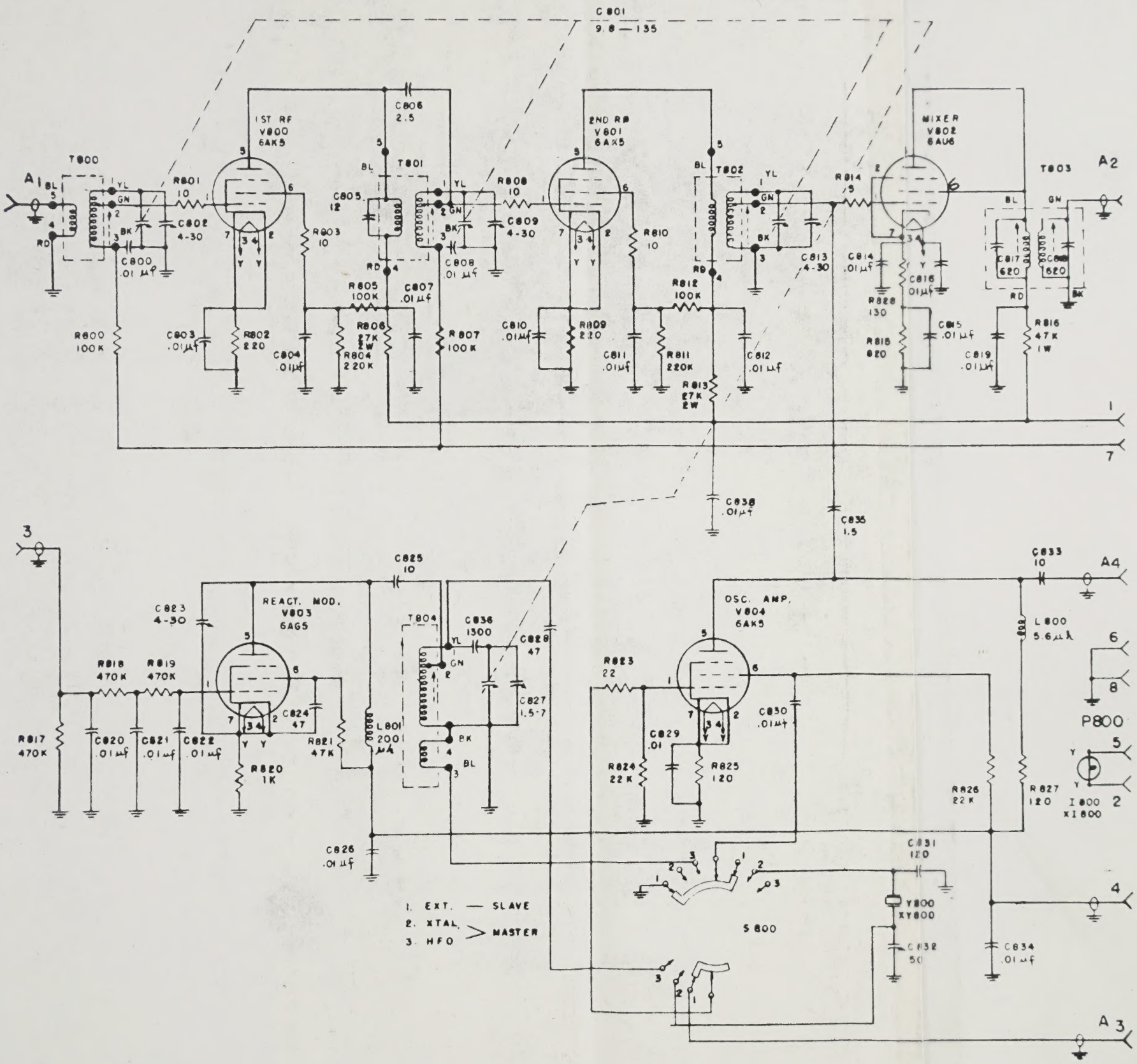
Schematic Diagram, Model FFRD-7B



ALL CAPACITOR VALUES ARE IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.

Schematic Diagram, Model FFRD-8B

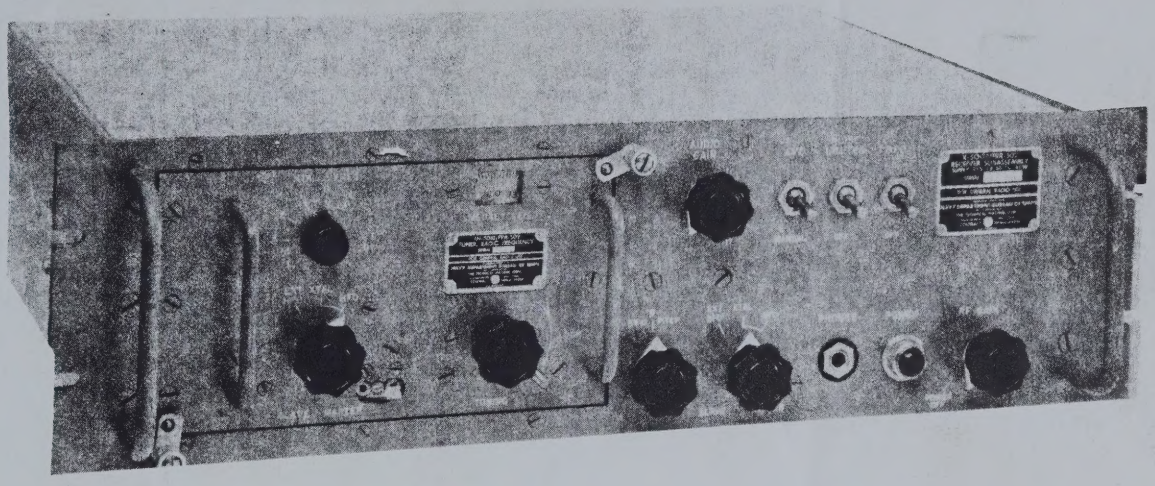


Figure 1-1. Communication Receiver, Model FFR -502

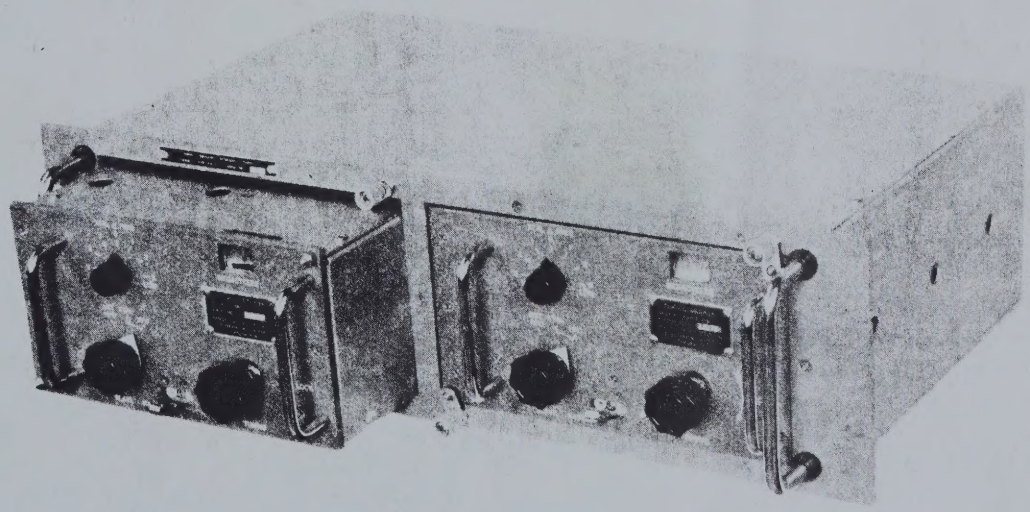


Figure 1-2. Tuning Drawer Storage Panel, Model FFR-DP